MOORE INDUSTRIES

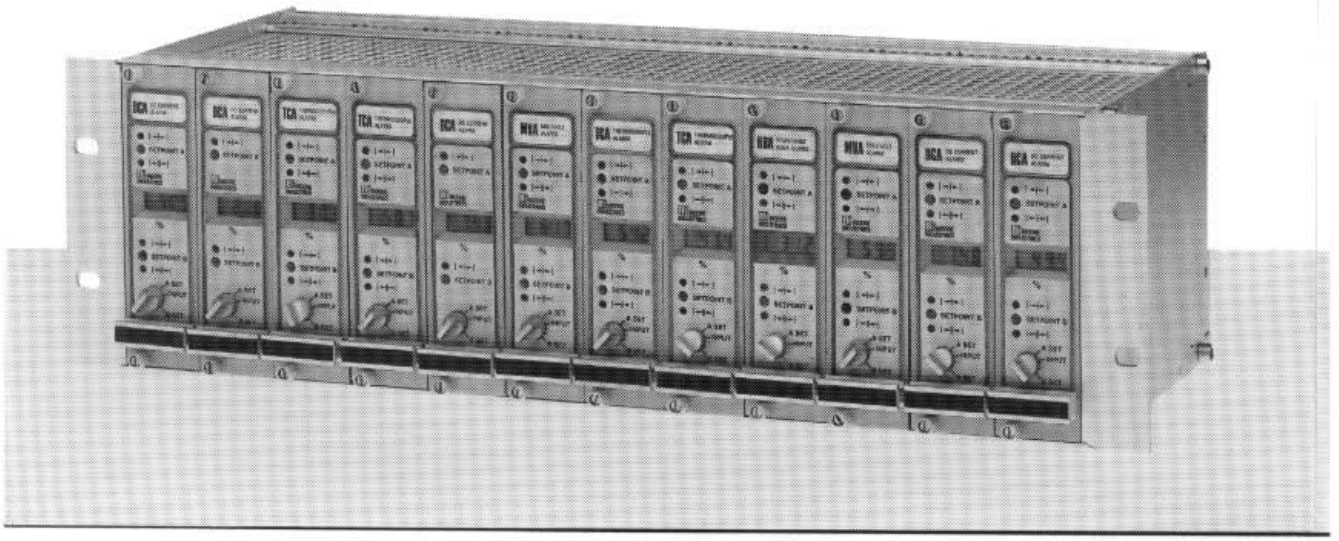
MVA-ED

Millivolt Alarm
Euro-style with Display

USER'S MANUAL

April 1991

No. 191-763-00 A



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MVA-ED

Introduction

Moore Industries' Euro-style Millivolt Alarm with Display (MVA-ED) accepts millivolt inputs and produces a contact closure output that changes states when the input signal exceeds the trip point setting. The MVA-ED may be factory-configured as a single alarm with one relay, or a dual alarm with two relays operating from either a single input or two independent inputs.

Each relay has a corresponding LED, which illuminates when the relay is energized. The unit normally operates in fail-safe mode; where the relay is normally energized and is de-energized under alarm conditions or power loss.

This manual contains descriptive, calibration, and installation information for the MVA-ED.

Description

The MVA-ED is a 4-wire alarm unit in a euro-style package. The unit features an LCD in 0.25-inch high black numerals over a reflective background. There are 3-1/2 active digits and a decimal point that display input and trip point values as a *percent* of span. Displaying these values is switch selectable via a rotary switch on the front panel of the unit.

The main board of the MVA-ED is divided into two identical halves (channels) with separate power supplies. A single alarm uses only one channel (single input, single output). A dual alarm uses both channels, with the inputs cross-linked (single input, dual output). For a dual input unit, both channels operate independently without crosslinking; this provides two single alarms on one board (dual input, dual output).

Two slide-switches on the printed circuit board allow each channel to be set to a high or a low alarm. Trip point controls allow the alarm to be set to trip at any point over the input range. Trip point potentiometers are provided to set the point at which each of the alarm relays change state. With a high alarm, the relay is de-energized when the input signal is above the trip point. The relay is de-energized when the input signal is below the trip point for a low alarm. See figure 1.

The dual input unit (DI Option) has two channels; A and B. Channel A is normally set to the higher trip point, but both channels are completely interchangeable.

Table 1 contains the performance and functional specifications for the MVA-ED.

Model Number. Moore Industries' model numbers identify the type of instrument, functional characteristics, operating parameters, any options ordered, and housing. If all accompanying documentation of a unit is missing, the model number can be used to obtain technical information. The model number for the MVA-ED is located on the plug-in connector.

Serial Number. A complete history is kept on every Moore Industries' unit. This information is keyed to the serial number. Whenever service data is required on a unit, it is necessary to provide the factory with the serial number. This information is engraved on the printed circuit board of the unit.

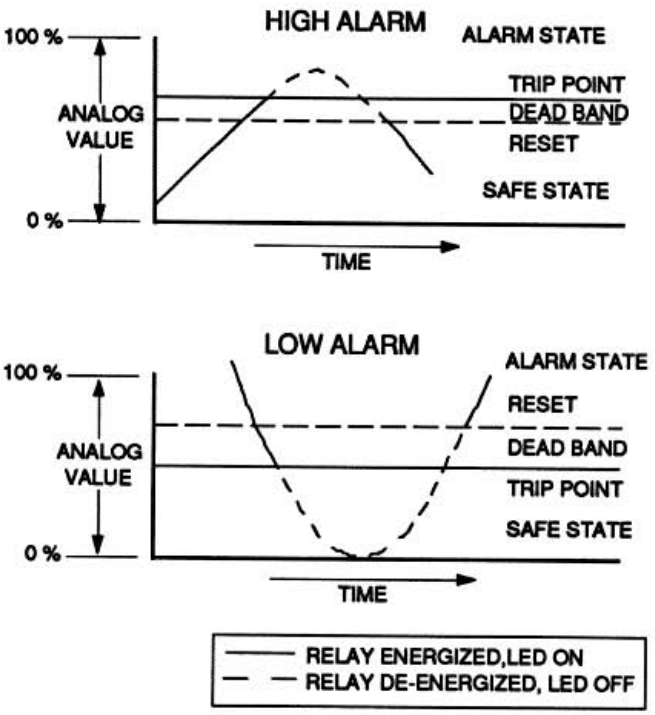


Figure 1. *High- and Low-Alarm Configurations*

Table 1. MVA-ED Specifications

Characteristic	Specification
Input	Input Ranges: **0-5 mV** **0-10 mV** **0-25 mV** **0-100 mV** **0-400 mV** Zero Elevation: customer specified in millibolts Input impedance greater than 10 MΩ
Output	1 or 2 DPDT relay contacts rated for 5 A @ 117 Vac, non-inductive, or 28 Vdc
Power	24 Vdc (±10%), 5 watts, nominal
Controls	**Trip Point:** Multiturn potentiometer adjustable over 0-100% of span **Dead Band:** Externally adjustable dead band 1-20% of span, nominal **Selection Switch:** Enables user to display input or trip point value **Zero Adjustment:** ±10% of maximum range value
Indicators	**LCD:** Shows trip point value and input value as a percent of span; switch selectable Type: LCD, 0.25" high black numerals over reflective background Format: 3-1/2 digits (–199.9 to 199.9) Operational Display Range: –25.0 to 125.0 Decimal point: One Rate: 2 readings per second Resolution: 0.1%, ± 1 count **LED:** Illuminates when corresponding relay is energized
Performance	**Repeatability:** Trip point repeats within ±0.1% of full span **Deadband:** 1% of span, standard **Response:** 150 milliseconds for a step change of 1% of span beyond trip points **Line Voltage Effect:** ±0.005% / 1% line change
Environmental Ratings	**Operating Temperature Range:** –18 to +65 °C (0 to 150 °F) Effect on amplifier: Less than ±0.01% / °F over above range
NOTE: Refer to the Installation Section for physical dimensions.	

Calibration

This section provides information necessary to adjust and calibrate the unit. Each unit is adjusted and checked at the factory for proper performance before shipping.

Before placing the MVA-ED into service, we recommend that you check the operational settings of the unit. Generally these checks, which are specified in Calibration Procedures, require little or no adjustments.

Controls

The MVA-ED features the Trip Point and Dead Band (optional) adjustments, and the Display Control located on the front panel of the unit. Other controls include the high- and low-alarm switches, which are located on the component side of the main PCB (see figure 2).

The Display Control is a rotary switch that is used to select a trip point setting or the input signal value (in percent of span) for display on the LCD.

The Trip Point and Dead Band adjustments are identified with the following symbolic markings:

| ◄┼► | represents Trip Point

|►‖◄| represents Dead Band

Each of these adjustments has a multiturn potentiometer that is adjustable with a slotted screwdriver. The type of potentiometer used with these adjustments usually requires twenty turns of the shaft to move the wiper from one end of its range to the other.

These potentiometers are equipped with a slip clutch at each end to prevent damage if the adjustment is turned beyond the wiper stop. Usually a slight change can be felt when the clutch is at the end of a

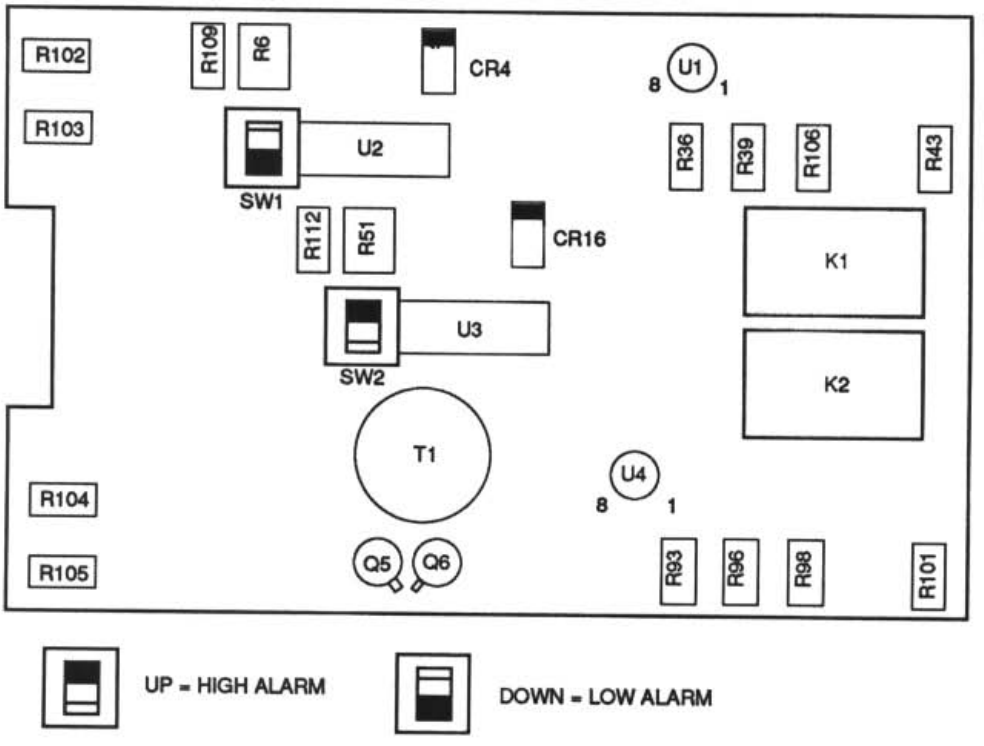


Figure 2. *MVA-ED Component Locations*

range (i.e., slipping). However, if this change is not detected, either end can be reached by turning the shaft twenty turns in the desired direction.

Indicators

Each MVA-ED is equipped with an LCD and one LED for each output relay. These are the only visual indicators on the MVA-ED.

The LED's. LED's associated with each output relay are located on the front panel of the unit MVA-ED.

These LED's indicate to the user when an alarm condition or power failure has occurred. The LED's are labeled "TRIP POINT A" and "TRIP POINT B" on dual alarm units, and "TRIP POINT" for single alarm units. See figure 3.

The LCD. The LCD has 0.25-inch black numerals over a reflective background. There are 3-1/2 digits with a decimal point to show operational values from –25.0 to 125.0. The display shows the trip point value and input value as a percent of span. These values are switch selectable from the front panel Display Control. See figure 3.

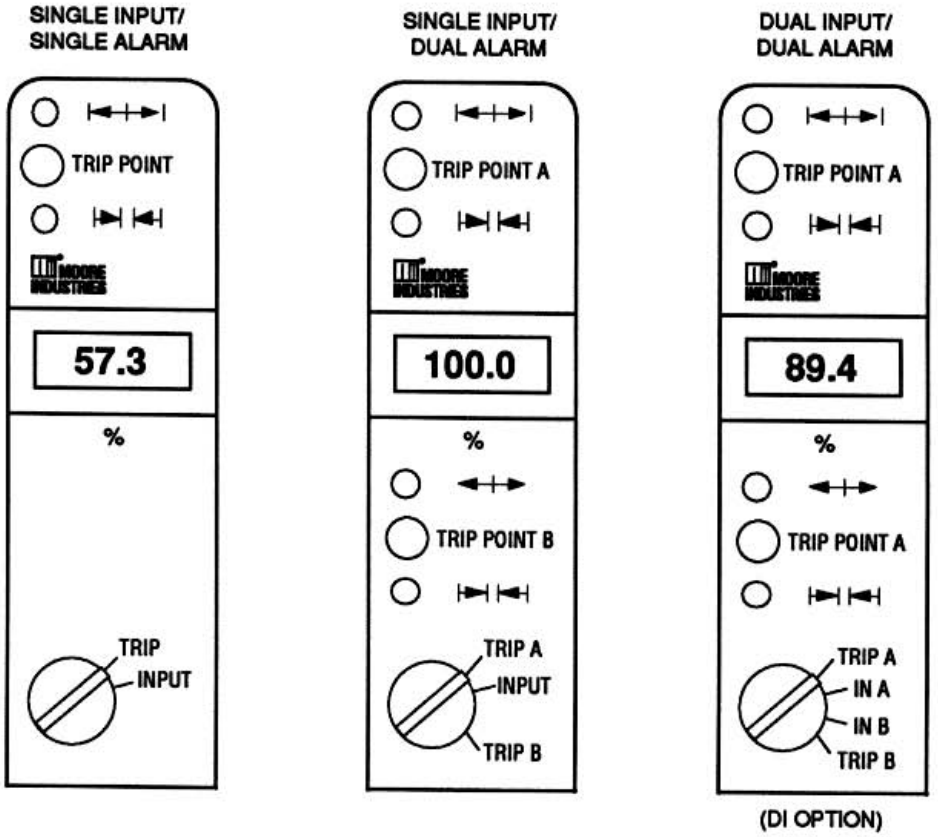


Figure 3. *Front Panel Configurations*

Calibration Equipment

Table is a list of the equipment required to calibrate the MVA-ED. This equipment is not supplied with the unit; it must be provided by the user.

Calibration Setup

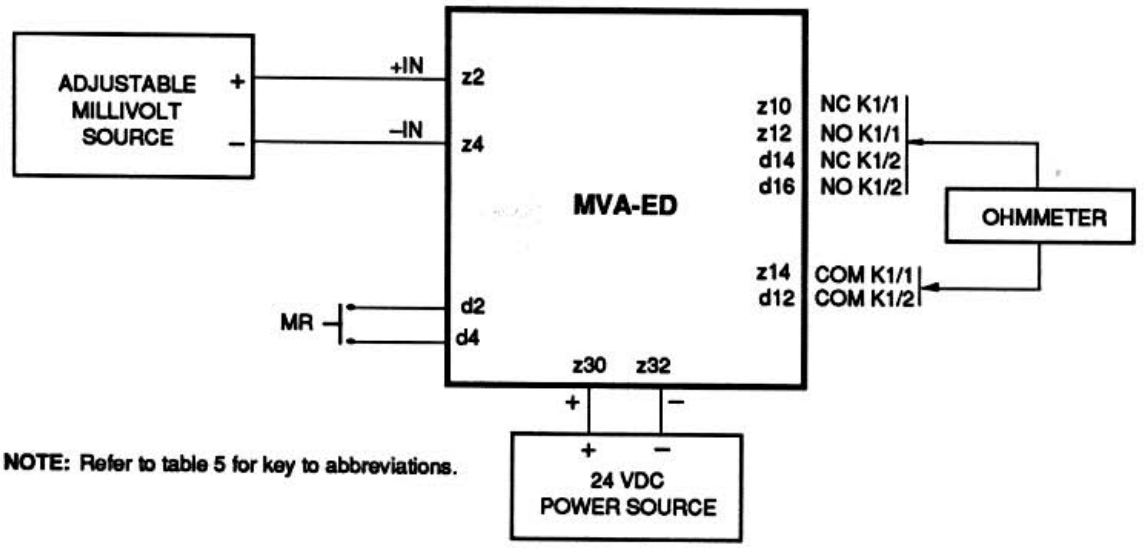
Off-line calibration for all MVA-ED units generally requires the same test equipment setup. Three separate configurations are provided better for clarity.

Figure 4 illustrates the setup for single-input units with a single output. Figure 5 illustrates the setup for single-input units with dual outputs. Figure 6 illustrates the setup for dual-input units with dual outputs.

At the factory, units are normally calibrated using a special test fixture to provide connection and a separate power supply. Calibration can be done on-site, using an extender card to bring the unit forward out of the rack, and using a typical dc power source. An extender card is available from Moore Industries.

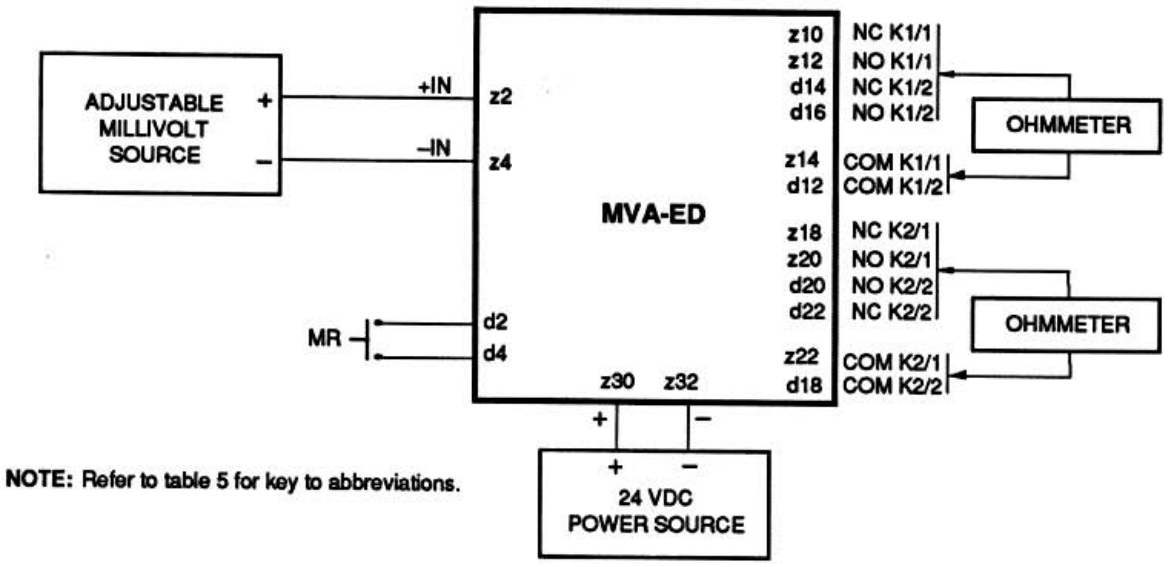
Table 2. *MVA-ED Calibration Equipment*

Equipment	Description
Precision Millivolt Source (adjustable)	Must be capable of producing millivolt ranges defined by input level requiremnts
DC Voltmeter	Accurate to within ±0.05%
Ohmmeter	Accurate to within 1%
Power Source	24 Vdc, 1A
Extender Card	Consult your Moore Industries rep for availability
Screwdriver (slotted)	Head width no greater than 2.54 mm (0.1 in)
Female Mating Connector (optional)	DIN 41612; Moore Industries P/N 800-121-27; 32-pin connector for use when calibrating a unit out of the rack



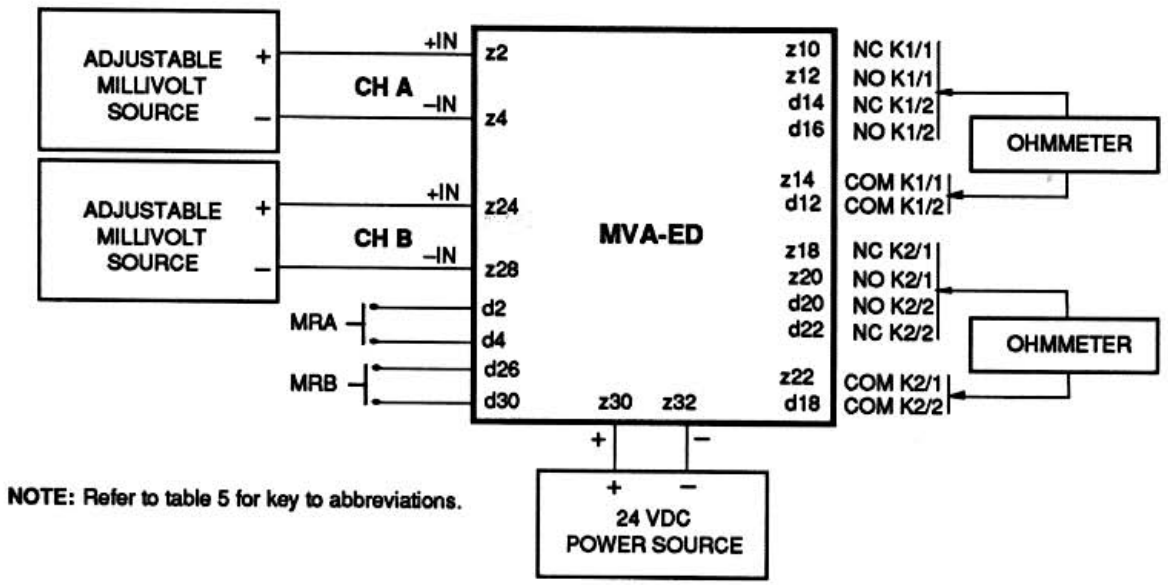
NOTE: Refer to table 5 for key to abbreviations.

Figure 4. *Calibration Setup for Single-input/Single-alarm Units*



NOTE: Refer to table 5 for key to abbreviations.

Figure 5. *Calibration Setup for Single-input/Dual-alarm Units*



NOTE: Refer to table 5 for key to abbreviations.

Figure 6. *Calibration Setup for Dual-input/Dual-alarm Units (DI Option)*

Calibration Procedure

Calibration consists of simulating an input signal to the MVA-ED, monitoring the input value on the LCD of the unit, and adjusting the controls to obtain the desired value. Trip point settings are also set and verified. The MVA-ED unit has an LCD, which shows the trip point value and input value in a percent of span.

1. Disconnect power from the euro-style rack.
2. Remove the MVA-ED to be calibrated from the rack.
3. Insert the extender card into the rack.

NOTE

If bench setup is preferred, use the 32-pin, female mating connector available through Moore Industries instead of the extender card. (P/N 800-121-27).

4. Insert the MVA-ED into the extender card.
5. Set switch SW1 (and SW2 for dual alarms) for a high or low alarm, as required. (see figure 2)
6. Connect an adjustable millivolt source and 24 Vdc power source to the MVA-ED.
7. Turn the Display Control to the INPUT position. (DI Option=IN B).
8. Connect a voltmeter from TP1 (U1-6) (+) to anode CR1 (–). (DI Option=TP4 (U4-6) (+) to anode of CR13 (–))
9. Set R36 to midpoint of travel. (DI Option=R93).
10. Apply power to the unit and set the millivolt source for a zero-percent input setting.
11. Adjust input zero pot (R39) to obtain 0 V at TP1. (DI Option=R96 to obtain 0V at TP4)

12. Connect the voltmeter from U1-3 (+) to U1-2 (–). (DI Option=from U4-3 (+) to U4-2 (–))
13. Adjust R36 to obtain 0.000 V. (DI Option=R93)
14. Repeat steps 8 & 11 to confirm 0 V at TP1. (DI Option=TP4)
15. The display should read 00.0 percent.
16. Set millivolt source to 100 percent of the input range.
17. If the display does not read 100.0 percent, adjust the display Span potentiometer, R6, for 100.0 percent.
18. For dual-alarm units, set the Display Control to the blank position between input and trip B. Adjust R51 for 100.0 percent on the display. (DI Option=R51)
19. Repeat steps 10 and 15 to verify a zero-percent input reading.
20. Apply 0-, 25-, 50- and 75-percent input. Observe the LCD at each setting and verify that the input is linear for the operating range selected.
21. Turn the selector switch on the front of the unit to TRIP A.
22. Set the TRIP A potentiometer (R102), located on the front panel of the unit, to the desired trip point value in percent of span.
23. For dual alarm and DI units, repeat steps 21 and 22 for TRIP B potentiometer (R104).

Calibrating a Unit with the AR Option

The Alarm Response Delay (AR) option introduces a time delay in the unit. This makes calibration difficult because the user must wait for the delay time to see if the setpoints have been tripped. The delay may be defeated by short circuiting diodes CR4 and/or CR16. Take extreme care in shorting diodes, as damage may occur if diodes are accidentally shorted to other parts.

Calibrating a Unit with the MR Option

If the Manual Reset (MR) option is present on your unit, the dead band circuit is not available. Verify that the unit latches upon alarm. Verify the unit resets only by shorting the MR terminals together with an exernal switch after changing the input signal from –25.0 to 125.0 percent.

The MR function resets both alarms in a single input, dual alarm units. For DI units, the MR function is separate for each channel.

Calibrating a Unit with the AD Option

The Adjustable Dead Band (AD) option provides an adjustable 1-20 percent dead band from the trip point (available to 100 percent). When the control variable is within this range, no control action takes place.

The following is a procedure for a *20 percent* dead band adjustment (unit must be setup as described in the previous calibration procedure). See figures 2 and 3.

1. Turn Dead Band A potentiometer (R103) fully clockwise.
2. Apply power to the unit.
3. Adjust TRIP (TRIP A) potentiometer to exactly 60 percent as indicated by the LCD when set to TRIP A.
4. Set SW1 alarm status to low. Check that the unit trips at 60 percent and resets at 80 percent or greater.
5. Turn the Dead Band potentiometer counterclockwise so the unit now resets at 80 percent, ±0.1 percent.
6. Set SW1 alarm status to high. Check that the unit trips at 60 percent and resets at 40 percent, ±2 percent.

7. For dual alarm or DI units, repeat steps 1 through 6 for TRIP B potentiometer and Dead Band B potentiometer (R105) using SW2.

Any amount of dead band between 0.5 percent and greater than 20 percent may be set using this procedure.

Completion of Calibration

1. Remove power from the euro-style rack.
2. Disconnect the calibration equipment and reconnect the input leads.
3. Remove the extender card and the MVA-ED.
4. Replace the MVA-ED in the rack.
5. Re-connect power to the rack.

Installation

This section provides physical mounting dimensions, installation procedures, and electrical connections. Although the units are designed to operate in free air at a high ambient temperature, it is recommended that if a large number of units are mounted together in a rack or cabinet, attention should be given to adequate ventilation. In addition, input and output values should be checked, on-site, before the unit is placed into service.

Mounting

The MVA-ED is a plug-in card that mounts in a euro-style rack. Moore Industries' Euro-style Rack is designed for high-density mounting of Moore Industries' euro-style devices. Up to12 individual cards can be installed in this standard 19-inch rack. Figure 7 shows the outline dimensions for the Euro-style Rack.

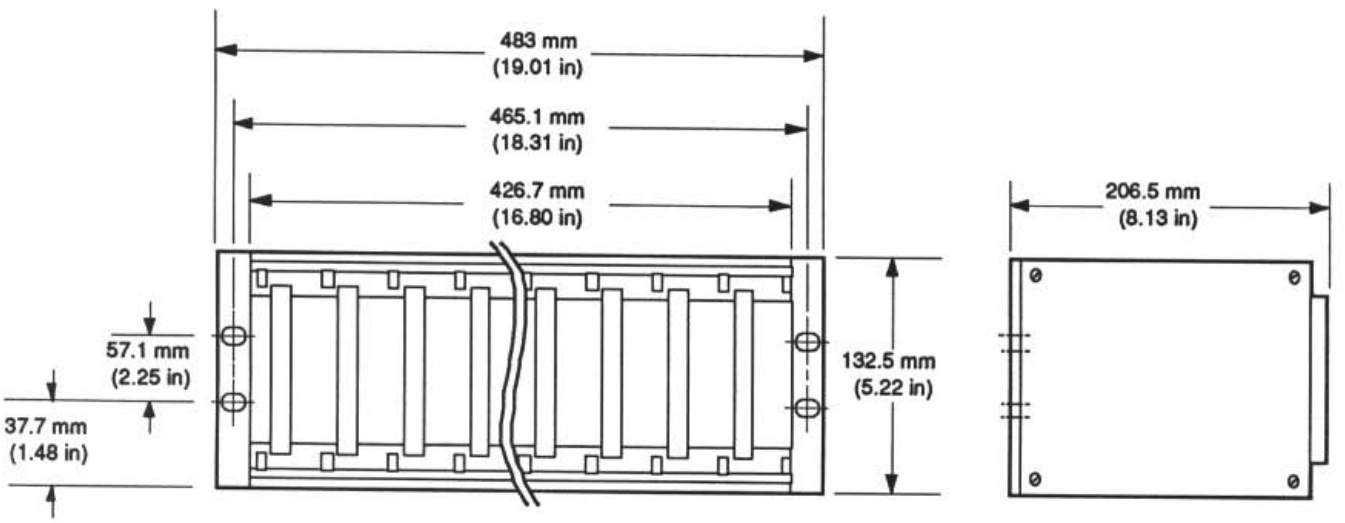


Figure 7. *Euro-style Rack Outline Dimensions*

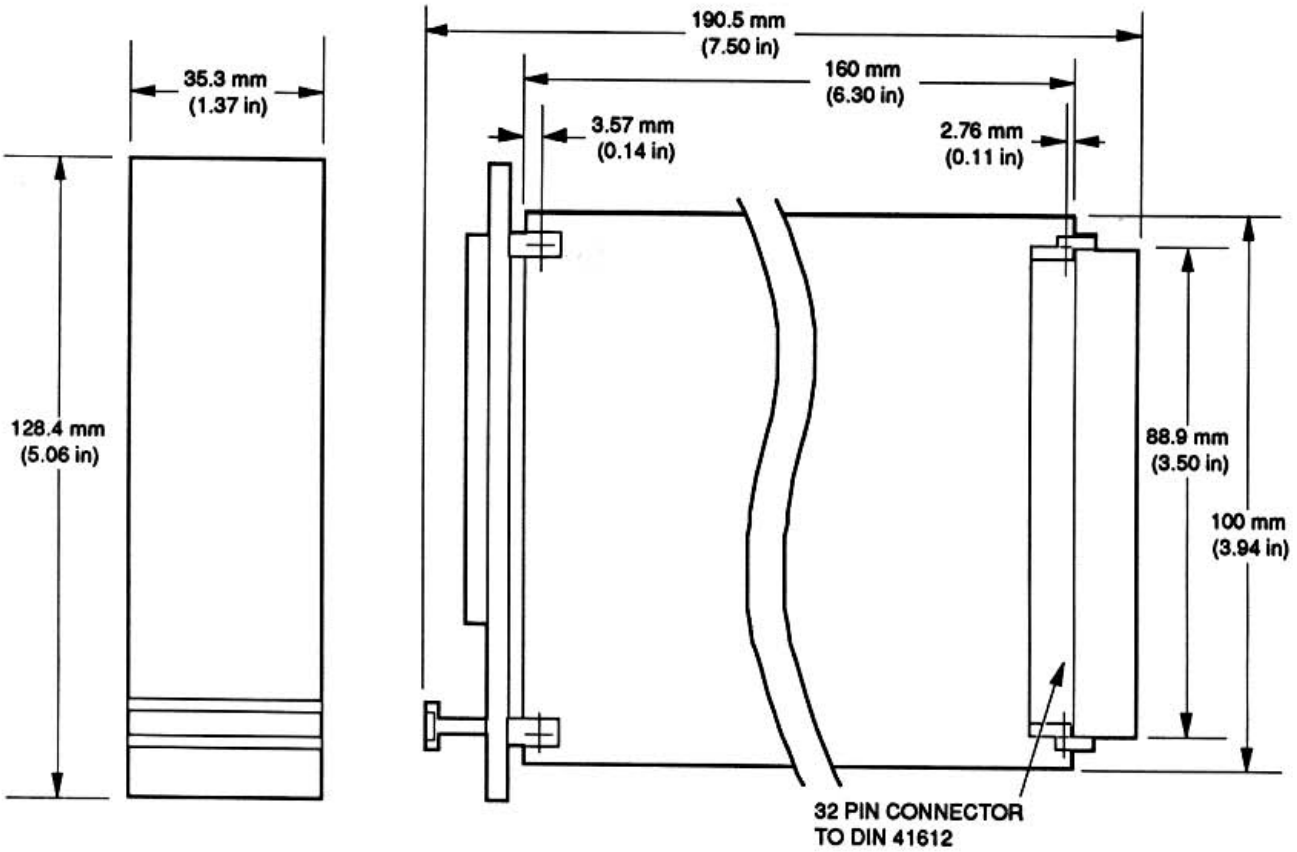


Figure 8. *MVA-ED Outline Dimensions*

The Euro-style Rack has 16-point screw connectors or 32-point screw connectors on the terminal block depending on the type of euro-style device selected. It is available without a terminal block for applications where terminal connectors (i.e., solder tags, wire wrap pins, etc.) are used.

Outline dimensions for Moore Industries Euro-style Rack and the MVA-ED are shown in figures 7 and 8, respectively.

Electrical Connections

All electrical connections to the MVA-ED are made to the terminals on the mating connector of the unit, located in the rack. See table 3, 4 or 5. (The terminals are designed for 16 AWG, maximum, wire size).

The MVA-ED operates directly from a 24-Vdc power source. The dc power source should be regulated to within ±10% of the nominal voltage and should be capable of delivering 5 watts.

Operation

Once the MVA-ED has been calibrated and installed, it may be left unattended. The only controls for the unit are the Trip Point and Dead Band potentiometers, which after initial adjustment require no further attention. The LED's on the front of the unit indicate

Table 3. *MVA-ED Connector Pins for Single-input/ Single-alarm Units*

Pin	Row d	Row z
2	MR	+IN
4	MR	–IN
6		
8		
10		NC K1/1
12	COM K1/2	NO K1/1
14	NC K1/2	COM K1/1
16	NO K1/2	
18		
20		
22		
24		
26		
28		
30		DC (+24)
32		DCC (Common)
NOTE: Refer to table 5 for key to abbreviations.		

Table 4. *MVA-ED Connector Pins for Single-input/ Dual-alarm Units*

Pin	Row d	Row z
2	MR	+IN
4	MR	–IN
6		
8		
10		NC K1/1
12	COM K1/2	NO K1/1
14	NC K1/2	COM K1/1
16	NO K1/2	
18	COM K2/2	NC K2/1
20	NO K2/2	NO K2/1
22	NC K2/2	COM K2/1
24		
26		
28		
30		DC (+24)
32		DCC (Common)
NOTE: Refer to table 5 for key to abbreviations.		

when an alarm is energized. Because the circuit uses highly reliable solid-state components with no moving parts, the MVA-ED operates maintenance free for extended periods of time.

The MVA-ED may become warm during operation, especially when a large number of cards are mounted together in a rack or cabinet, and the ambient temperature is above normal. This is perfectly acceptable and should not be a cause for alarm, unless a malfunction is also observed.

A periodic check of terminal connections is recommended every six months to ensure continued dependability of service.

Table 5. *MVA-ED Connector Pins for Dual-input/Dual-alarm Units (DI Option)*

Pin	Row d	Row z
2	MR, Channel A	+IN, Channel A
4	MR, Channel A	–IN, Channel A
6		
8		
10		NC K1/1
12	COM K1/2	NO K1/1
14	NC K1/2	COM K1/1
16	NO K1/2	
18	COM K2/2	NC K2/1
20	NO K2/2	NO K2/1
22	NC K2/2	COM K2/1
24		+IN, Channel B
26	MR, Channel B	
28		–IN, Channel B
30	MR, Channel B	DC (+24)
32		DCC (Common)

KEY: **COM**, common
DC, 24 Vdc
DCC, 24 V common
K1/1, first pole of number one relay
K1/2, second pole of number one relay
K2/1, first pole of number two relay (dual output units only)
K2/2, second pole of number two relay (dual output units only)
MR, manual reset
NC, normally closed relay contacts
NO, normally opened relay contacts

Maintenance

Maintenance of the MVA-ED is limited to keeping the terminals clean and tight, and ensuring there is adequate ventilation or heat dissipation for the unit. It is recommended that the user check the terminals every six months.

Troubleshooting

Troubleshooting the MVA-ED involves determining whether the unit is functioning abnormally. The calibration equipment listed in table 2 can be used to verify that the MVA-ED outputs are within specified limits. See specifications, table 1. It is recommended that any unit found performing below specifications be returned to the factory for service, in accordance with the instructions on the back cover of this manual.

If a problem is suspected with the MVA-ED, it is suggested that the following check list be reviewed as a preliminary step:

1. Verify that all electrical connection are clean and tight.
2. Verify that the measuring instrument used for input voltage or current is of the proper range and accuracy.
3. Verify that the output circuit is electrically isolated from the input circuit.

If a unit is performing below specifications, and the unit cannot immediately be sent back to the factory without affecting operations, contact your local Moore Industries representative for assistance.

RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

   Non-Warranty Repair –
   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

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